

Strengthening the Rule of Law for the Future of Democracy - Anticipated Trends in Law in the Digital Era

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Abstract:

Introduction: The digital era is reshaping not only technology and economy but also the legal systems governing democratic societies. The rapid emergence of artificial intelligence, big data, and digitisation calls for proactive adaptation of legal frameworks. This article explores the intersection of digital transformation and the rule of law, emphasizing its implications for democratic stability.

Methods: The authors used a qualitative approach based on literature review, document analysis, and synthesis of recent academic and policy reports related to digital technologies and their impact on law and governance. Selected case examples illustrate emerging legal issues in digital environments.

Results: The study identifies key trends influencing the evolution of law, including AI governance, digital privacy, cybersecurity, e-courts, and legal adaptations to remote work and blockchain technologies. Legal education and digital literacy are also highlighted as crucial areas for strengthening the rule of law.

Discussion: Digitalisation brings opportunities to increase legal efficiency and access but also challenges existing legal norms. The authors argue for anticipatory legal reform, interdisciplinary cooperation, and stronger international frameworks to respond effectively to emerging digital risks and opportunities.

Limitations: The paper primarily focuses on European contexts and emerging trends rather than providing empirical data or cross-regional comparisons. Future research could broaden the scope to include diverse legal systems globally.

Conclusions: Digital transformation significantly influences democratic institutions and legal systems. Strengthening the rule of law requires adaptive

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legislation, digital competence among legal professionals, and mechanisms to uphold rights and ethics in technologically driven societies.

Key words: law, rule of law, democracy, digital era.

Introduction

The authors discuss the background to the digital era, digitization, data, knowledge and decision making as part of the digital era. In terms of digitisation, data, knowledge and decision-making, new technologies are coming to the fore; the authors give selected examples of these. In the next part of the paper, they will focus on anticipated trends in law.

1 Digital era, digitalization, data and knowledge

In the current digital era, the world around us is fundamentally changing. Technologies that existed only in theory a few decades ago are now ubiquitous and are shaping the way we communicate, work, learn and make decisions (Stacho, 2024a,b, 2025). With the advent of digital technologies, particularly the Internet, big data and artificial intelligence, the world is moving into an era characterized by the transformation of information into a valuable but also highly sophisticated resource. One of the most important aspects of this digital revolution is the process of digitisation, which concerns the conversion of traditional, analogue and paper-based systems into digital platforms. This process involves not only the digitisation of the data itself, but also a whole reformulation of business models, educational processes, government services and personal interactions in a digital environment. This transition brings not only challenges but also countless opportunities to improve efficiency, accessibility and innovation in different areas of society. One of the key products of digitalization is the vast amount of data that is generated and processed in real time. This data is becoming the most valuable asset of the modern economy and society. Big data and data analytics enable organisations, businesses, governments and individuals to better understand the world around us, predict trends, improve performance and make informed decisions. They also enable us to optimise business operations, personalise services and develop new products and services. But data in itself is not valuable without the right interpretation. The knowledge we gain from analysing data becomes the basis for decision-making. In the digital era, where information is available almost at our fingertips, decision-making processes are becoming increasingly complex. It is necessary not only to collect the right data, but also to know how to process, evaluate and

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apply it in specific situations. This is where artificial intelligence (AI) and machine learning come in, enabling automated decision-making based on analytical models, which significantly increases the speed, accuracy and efficiency of decision-making processes.

Artificial Intelligence (ChatGPT, 2024) defines the digital era as a period in human history that is characterised by the proliferation and intensive use of digital technologies, particularly computers, the internet and mobile devices. It began in the second half of the 20th century, when computing and digital technologies began to develop massively and their penetration into people's daily lives became increasingly pronounced. The main characteristics of the digital era are:

1. Internet and connectivity - the Internet has become a global tool for communication and information transfer. Connectivity between people, businesses and organisations is now almost instantaneous and worldwide.
2. Mobile devices - with the development of smartphones and tablets, technology has become mobile. Users can access information and communication anytime, anywhere.
3. Cloud computing - storing data on servers in the 'cloud' allows access to information without the need for a physical data storage device, making it easier to access applications and data.
4. Artificial intelligence and automation - AI, machine learning and process automation are dramatically increasing efficiency in many areas such as healthcare, finance, manufacturing and services.
5. Social media - platforms such as Facebook, Instagram, Twitter and YouTube have enabled a new form of communication and information sharing, which has had a profound impact on social, political and economic life.
6. Big data and data analytics - the processing of vast amounts of data allows for a better understanding of behavioural patterns, leading to more accurate predictions and decision-making in various fields (e.g. marketing, healthcare, politics).
7. Digital economy - e-commerce and digital services have become a major driver of economic growth, with many traditional industries moving into the digital environment (ChatGPT, 2024).
8. In terms of digitisation, data, knowledge and decision-making, new technologies are coming to the fore (Horváth, Hlásny, & Krásna, 2024; Hlásny, 2021, 2023). We give a selection of them as examples.

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- Data conversion is the process of changing data from one format to another. Data conversion usually involves converting data from one file type to another file type or from one data type to another data type. The goal of data conversion is to allow different applications and systems to use the data regardless of its original format. As Song (2023) writes, typical examples of data conversion involve converting data from a text file to a spreadsheet file or from numeric data to textual data. Data conversion can be performed manually or automatically using data converters or other tools. In general, data conversion is the process of changing data from one format to another. Data conversion allows different applications and systems to use data regardless of its original format and can be performed manually or automatically. The topic of energy-sensitive early warning data in relation to the conversion platform has been described by Gao et al. (2022). For the problems of data mining and data utilization in the energy-sensitive early warning data conversion process, this paper builds an early warning data conversion platform based on an evolutionary algorithm with multiple objectives. It can be divided into data layer, application layer, ontology layer and business layer. The data layer mainly uses Named Entity Recognition (NER) method to collect data information in the system according to the early warning of energy sensitive data recorded in the previous system so as to provide the data base for the constructed knowledge map. The ontology layer is based on a protected ontology structure and uses analytical tools to realize the relationship between entities in order to create a data conversion model of energy sensitive data analysis of energy equipment data. Based on the ontology layer, the business layer converts the sensitive early warning data collected by the data. At the same time, it can effectively supplement the distance between the lost systems collected data information query and enterprise operation, so-called to facilitate the application layer to quickly locate the problem and its diagnosis. The process of ‘root cause analysis of early warning and fault processing status’ is carried out in the data processing layer. In this paper, the named entity recognition method is adopted in the process of converting electronically sensitive early warning data. With the target task as the topic, this method can be used to identify the boundary of the naming process in the power text, in the division of the classification results into sets as defined. Currently, the named entity recognition method can be classified into rules, dictionaries and online knowledge base recognition methods.
- Optical Character Recognition - OCR (Optical Character Recognition) is a technology used to recognize characters in images or documents and convert

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them into text data. OCR typically uses machine learning methods for character recognition and enables automated extraction of text data from images or documents. Optical Character Recognition (OCR) is the process of translating images of text into an understandable machine-readable format. In general, an OCR system consists of binarization, segmentation, and recognition phases. Given an extracted binary character, the recognition stage provides its description and decides its corresponding ASCII code. In this paper, we propose a novel OCR system that focuses on high-speed, multiscale, and multifold character recognition. Our proposal is basically based on robust description using a new Unified Character Descriptor (UCD). In addition, font type and font size recognition is performed to select the appropriate template for faster matching process. The obtained OCR accuracy of our proposed system is 1.5 times higher than the accuracy achieved by Tesseract on the LRDE dataset (Suoa et al., 2015). Other authors Huynh et al. (2022) on the topic of Optical Character Recognition (OCR) state that in recent decades, a large number of documents have been digitized before undergoing Optical Character Recognition (OCR) to extract their textual content. This step is crucial for indexing documents and making the resulting collections accessible. However, the fact that documents are indexed through OCR'd content causes a number of problems due to the changing performance of OCR methods over time. Indeed, the quality of OCR has a significant impact on indexing and thus on the accessibility of digital documents. Named entities are among the most appropriate information for indexing documents, especially in the case of digital libraries, where log analysis studies have shown that approximately 80% of user queries include a named entity. With the full computational power of modern Natural Language Processing (NLP) systems, Named Entity Recognition (NER) can be efficiently run on huge OCR corpora. Despite advances in OCR, the resulting text files still contain misrecognized words (or noise, for short) that harm the performance of NER. In this paper, to meet this challenge, we apply a spelling correction method to noisy corpus versions with variable OCR error rates to quantitatively estimate the contribution of post-OCR correction to NER. Our main finding is that we can indeed continuously improve NER performance when OCR quality is reasonable (error rates between 2% and 10% for characters (CER) and between 10% and 25% for words (WER)). The noise correction algorithm we propose is language-independent and has low complexity (Huynh et al., 2022).

- Optical Mark Recognition - OMR (Optical Mark Recognition) is a technology that is used to recognize check marks on paper forms or tests.

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OMR typically uses machine learning methods to recognise crossed-out boxes and enables automated extraction of information from paper forms or tests. On OMR (Optical Mark Recognition), Saad et al. (2021) that the most important factor to consider when transmitting private information over the Internet (i.e., an unsecured channel) is security. Steganography is used to protect this data from unauthorized access during transmission. Steganography is a scheme for securing sensitive information by hiding it in media such as digital images, videos, audio, text, etc. Current image steganography methods work as follows; assigns a cover image and then embeds the secret message into it by modifying the pixels to create the resulting stego-image. These modifications allow the steganalysis algorithms to detect the embedded secret messages. Thus, the concept of covertless data hiding is proposed to solve this problem. No wrapper does not mean that the secret message will be sent without using a wrapper file or the wrapper file can be discarded. Instead, the secret message will be embedded by generating a wrapper file or mapping the secret message. In this paper, a novel, highly robust cover-free image steganography method based on optical mark recognition (OMR) and rule-based machine learning (RBML) is proposed.

- Intelligent Character Recognition ICR (Intelligent Character Recognition) is a technology that is used to recognize handwritten characters and convert them into text data. ICR typically uses machine learning methods to recognize handwritten characters and enables automated extraction of information from handwritten documents or forms. As an example, we present the paper by Surya et al. (2020). The authors write that computational linguistics involves computer science techniques that play a vital role in recognizing written or printed characters, such as numbers or letters, to turn them into a form that a computer can use efficiently. Convolutional neural network differs from other approaches by automatically extracting features. The proposed approach is capable of recognizing characters in a variety of challenging conditions using convolutional neural network where traditional character recognition systems fail, especially in the presence of low resolution, significant blurring, low contrast, and other distortions. Intellectual Character Recognition System is an application that uses Convolutional Neural Network (CNN) to recognize a Tamil character dataset precisely developed by HP Labs India. The novelty of this system is that it recognizes the characters of the predominant Tamil language. Using suitable datasets consisting of Tamil scripts, the model is trained efficiently. This work yielded a training accuracy of 99.16%, which is much better compared to traditional approaches.

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- Intelligent Document Recognition - IDR is a technology that is used to automatically recognize and classify different types of documents based on their content and format. IDR typically uses machine learning methods to recognize and classify documents and enables automated processing. Abbas et al. (2022) on the topic state that the paper presents a handwritten document recognition system based on convolutional neural network technique. In today's world, handwritten document recognition is rapidly gaining the attention of researchers due to its promising behavior as an assistive technology for visually impaired users. This technology is also useful for users of automatic data entry system. In the proposed system, a dataset with images of handwritten characters in English language has been prepared. The proposed system was trained for a large sample data set and tested on sample images of user defined handwritten documents. In this research, several experiments have been conducted to obtain very worthy recognition results. The proposed system first performs image preprocessing stages to prepare the data for training using convolutional neural network. After this processing, the input document is segmented using line, word and character segmentation. The proposed system obtains accuracy up to 86% during character segmentation. Then these segmented subjects are sent to a convolutional neural network for their recognition. The recognition and segmentation technique proposed in this paper provides the most acceptable accurate results on a given dataset. The proposed work approximates the result accuracy during training of convolutional neural networks up to 93% and to confirm that the accuracy slightly decreases with 90.42%.
- Big data is a term used to describe large amounts of data that are difficult to process using traditional IT technologies. Big data usually comes from a variety of sources such as sensors, transactions, social networks and websites, and can include different types of data such as text data, numerical data and image data. Big data processing involves the use of special tools and technologies that enable the collection, processing and analysis of large amounts of data. These tools and technologies typically include cloud services, distributed systems and parallel computing. The aim of big data processing is to extract information about data that can be used for a variety of purposes.
- Artificial Intelligence (AI) is a field of information technology focused on developing computer systems that can perform tasks that would be consistent with the intelligence of the human brain. The goal of AI is to create computer systems that can learn, think, and make decisions the way humans do. AI is usually implemented using machine learning methods that allow computer

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systems to automatically learn from data and build models based on learned information. AI is used in a variety of fields such as speech recognition, image recognition, robotics, and healthcare. In general, artificial intelligence is a field of information technology focused on the development of computer systems capable of performing tasks associated with the intelligence of the human brain. AI is implemented using machine learning methods and is used in a variety of fields.

- ChatGPT is an artificial intelligence model developed by OpenAI. It is one of the most advanced AI technologies on the market that can naturally interact with humans in real time. ChatGPT uses deep neural network learning methods and can learn based on the data that is provided to it. ChatGPT is used for a variety of purposes such as a chat interface for websites, an interactive assistant for mobile apps, or a virtual assistant for home devices. ChatGPT is able to interact naturally with people and can hold conversations on a variety of topics. Verma and Lerman (2022) write on the topic that the technology, created by the same organization that launched the text-to-picture generator Dall-E to the public, has already gathered more than a million users since its launch last week. It is powered by a large-scale language model, an artificial intelligence system trained to predict the next word in a sentence by ingesting vast amounts of text from the internet and finding patterns through trial and error. ChatGPT was then refined by using feedback from humans on the conversation - just as a robot in 2022 could reasonably do. OpenAI, an organization founded a few years ago with funding from Elon Musk and others, warns that ChatGPT isn't perfect and will sometimes give offensive or misleading answers. However, this hasn't stopped social media users from asking creative questions and posting the results online. So what exactly is ChatGPT and how does it work? Artificial intelligence can now create any image in a matter of seconds, bringing wonders and dangers. ChatGPT is a project of OpenAI and an attempt to make "talking" with AI feel smooth and natural, almost like a conversation between humans. Users can ask questions of the AI in a function similar to instant messaging and explore the knowledge gathered for the model. ChatGPT will answer questions in full sentences and attempt to mimic the rhythm of the conversation. Note, however, that its answers are not always correct or appropriate. ChatGPT does not have a personality per se, instead it can combine knowledge gathered from many sources along with training from humans. "As a machine learning model, I don't have feelings," the model's answer will tell you if you ask what it feels like. "I'm designed to process and generate text based on the input I receive." The model - which the company's CEO said in a tweet costs

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an "eye-pleasing" amount to run - can get stuck on certain phrases, including reminding you that it is what it says it is. "The model is often overly detailed and overuses certain phrases, such as repeating that it is a language model trained by OpenAI," the company writes online. OpenAI's philosophy is to release these models before all guardrails are in place, in hopes that user feedback will help the company find and address damage based on real-world interaction (Verma & Lerman, 2022).

- In general, for effective use of data from IoT devices, it is necessary to ensure its proper collection, processing and analysis. This usually involves using a combination of different IT solutions such as IoT platforms, IoT gateway, data analytics, dashboarding and predictive models. IoT platforms are software solutions that enable the collection, management and analysis of data from different IoT devices. IoT platforms typically provide features such as device management, data security, data visualization applications, and integration with other systems. The goal of an IoT platform is to enable efficient use of data from IoT devices for various purposes such as monitoring and control, predictive maintenance, and decision making. IoT platforms can consist of various components such as cloud services, device applications, APIs for integration with other systems, and tools for data analytics. Quedraogo et al. (2021) propose an Autonomous Management System (AMS) for Internet of Things (IoT) platforms that uses the concept of autonomous data analysis task cycle to improve and maintain performance in IoT platforms. The concept of an "autonomous data analysis task cycle" is a type of autonomous intelligent supervision that enables the achievement of strategic goals around a given problem. In this paper, they propose a conceptualization of an AMS architecture composed of an autonomous cycle to optimize quality of service (QoS) and to improve quality of experience (QoE) in IoT platforms. The autonomous cycle discovers and detects the current operational state in an IoT platform and determines a set of tasks to guarantee a given performance (QoS/QoE), and they present the details of the AMS architecture (components, knowledge models, etc.) and its use in two case studies: a typical application in an IoT context and a tactile IoT system.
- An IoT gateway is a device or application that enables communication between IoT devices and cloud or on-premises IT systems. An IoT gateway typically provides features such as data security, protocol translation, and data filtering. The goal of an IoT gateway is to allow data from IoT devices to pass through to IT systems without being corrupted or misused. An IoT gateway can be a physical device or an application that is part of an IoT platform or another IT system. An IoT gateway typically acts as a bridge

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between IoT devices and cloud or on-premises IT systems, allowing data from IoT devices to pass into these systems and be used for a variety of purposes. Zolotova et al. (2015) write in this context that new approaches and technologies such as the Internet of Things (IoT), cloud computing and big data are leading to the next industrial revolution. They propose the implementation of an industrial gateway architecture that adopts the idea of IoT, intelligent methods, machine-to-machine and cyber-physical systems. The proposed gateway creates a virtual representation of the physical world that scans technology layer devices in real time. It creates a unified communication interface for the heterogeneous technology layer, enabling device self-management, diagnostics, and self-reconfiguration to improve the quality of service using cloud-based SCADA and MES services. The proposed gateway was tested in an experimental setup with a programmable logic controller.

According to ChatGPT (2025a), digitisation is not only a technical process, but also a cultural and social change that affects the way we live, work and communicate. It is central to the development of a modern democratic society, but it also requires a responsible approach to the ethical, legal and social issues involved.

2 Anticipated trends in law in the digital era

Today, digitisation and technological advances are also having a significant impact on the legal sector. Law is adapting to new technologies, which creates new challenges but also opportunities. The anticipated trends in law under the influence of the digital era and digitalisation include several aspects, I will list a selection of them.

1. Data protection and privacy law - Data protection will be an increasing legal concern, especially with the proliferation of digital technologies and the large-scale use of personal data. New laws are emerging, such as the GDPR in the European Union (GDPR, 2016), and similar legislation in other countries that emphasize the protection of individuals' privacy. With the increasing use of surveillance technologies (e.g., via mobile devices, cameras, sensors), it will be important to balance the right to data protection (Act No. 18/2018 Coll. - Act on the Protection of Personal Data and on Amendments to Certain Acts) and the right to security. Anticipated trends in the law under the influence of the digital era and digitalisation show that the law will have to constantly evolve to adapt to new ways of processing data, such as artificial intelligence and big data analytics.

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2. Legal issues related to artificial intelligence (AI) - AI decision-making liability is a serious topic as AI is increasingly used for decision-making in a variety of fields, from banking to healthcare. The issue of accountability for decisions made by AI will be key. Who will be responsible if AI makes a mistake? This issue also relates to the ethical issues that arise in the development of AI (European Parliament, 2025). Also, with the development of autonomous vehicles, robots and drones, legal frameworks will have to adapt to new technologies. Rules on safety, ownership and liability of autonomous systems will have to be defined, which is what we are drawing attention to in view of the expected trends in law under the influence of the digital era and digitalisation.
3. Blockchain technology and regulation of cryptocurrencies - with the increasing use of cryptocurrencies (such as Bitcoin, Ethereum) and blockchain technology, new legal challenges are emerging, particularly in the areas of regulation of financial markets, taxation, and consumer protection (Council of the European Union, 2024). New regulations are emerging to protect against fraud and money laundering, but it is still unclear exactly how blockchain will be regulated in different countries. Also, Smart contracts, which are automated, digital contracts based on blockchain technology, will increasingly be used in commercial and legal relationships. The legal and technical aspects of these contracts, including the possibility of dispute resolution and enforceability, will need to be clarified (Investopedia, 2024), which is emphasised in the context of the anticipated trends in law under the influence of the digital era and digitalisation.
4. Digital law and cybercrime refer to the anticipated trends in law under the influence of the digital era and digitalization, and the fact that as digital technologies increase, so do the number of cybercrimes such as hacking, phishing, identity theft, and ransomware attacks. Laws will need to counter new types of crime and ensure international cooperation to investigate and prosecute cybercrime (Drazova, n.d.). Also, with the increasing amount of sensitive data being stored online, better protection of digital infrastructure and information from attacks will have to be ensured. This may lead to new legislation on cybersecurity and liability for failures in data protection (European Commission, 2022).
5. Digital transformation of court processes, legal services via the Internet, e-courts, digital evidence will be part of the expected trends in law under the influence of the digital era and digitalization. It is already becoming apparent that the way legal disputes are resolved will change with digitalisation. Electronic courts, online filing of documents and virtual hearings will

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become more common. Related to this is the need to modify the rules relating to e-evidence (SITA, 2022). The rapid development of legal technology (legal tech) enables the provision of legal services over the internet, such as automated legal advice, contract generation or AI-assisted analysis of legal documents (Matejka, 2023). This can reduce the cost of legal services and make them accessible to a wider range of people.

6. Legal issues relating to work and employment relations in the context of anticipated trends in law under the influence of the digital era and digitalisation. With remote work and digital work, as more and more people work remotely, issues related to the legal aspects of digital work, such as working conditions, employment law protection and digital security, are emerging (Treľová, 2025). Also, the rapid development of the gig economy, freelancing and flexible working models raises the need to adapt labour law to encompass new forms of employment, including contracts and worker protections.
7. The regulation of internet platforms and social media represents a further challenge in the context of anticipated trends in law under the influence of the digital era and digitalisation. Legal issues relating to the liability of internet platforms (such as Facebook, Google or YouTube) for the content generated by their users will become increasingly important. The debate on how to balance freedom of expression and protection from harmful content such as hate speech, misinformation or online harassment will continue (European Commission, 2025). Digital copyright and intellectual property protection in the context of anticipated trends in law under the influence of the digital era and digitalisation suggest that with the increasing amount of digital content and new technologies for sharing and copying media, the legal protection of intellectual property will also have to adapt (European Commission, 2025a).

Digitalisation and new technologies bring not only opportunities to improve the efficiency of legal processes, but also new challenges that require a dynamic approach to the development and implementation of legislation. As technology advances, the law will need to respond flexibly to new situations that arise in the digital world.

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Conclusions

ChatGPT (2025b) also identifies the following challenges of the digital era:

- Cybersecurity, with the increased amount of data and connected devices, the risk of cyber-attacks that threaten privacy and security is also increasing.
- Digital inequality as a challenge due to the fact that not everyone has the same access to technology and internet services, which can widen social and, we assume, economic disparities.
- Disinformation and fake news is another challenge because the digital space is a frequent venue for the dissemination of unverified information with obvious negative impacts on public awareness and democracy.
- The loss of jobs as a prerequisite for automation and robotisation and the related assumption that some traditional jobs may disappear, leading to the need for retraining of the workforce.

Digitalisation, data, knowledge and decision-making are inextricably linked and form the basis of new business and technology paradigms. This process is having a profound impact on everyday life, not only in businesses, but also in the personal sphere, government institutions and the public sector. In the new digital reality, decision-making is becoming more dynamic, faster and more analytical, enabling individuals and organisations to adapt to rapidly changing conditions. The topic of digitisation, data, knowledge and decision-making (Zapletal, 2019, 2020, 2024) is therefore key to understanding how the world is changing in the digital era.

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